

Chemical Detectors Analysis for First Responders

Across the country, first responders and National Guard civil support teams are routinely called upon to assess and analyze accident scenes, industrial spills, and potential terrorist attacks for the presence of deadly gaseous chemicals and toxins. Since the terrorist

attacks of September 11, 2001, this job has become even more important and crucial to the health and safety of citizens in the United States and around the world.

If a major chemical spill or terrorist attack plagued an entire region, county, or series of states, first responders using one of several hundred different brands and models of detectors could report a variety of results and findings potentially causing public panic or the deployment of unnecessary and costly resources. For instance, most military units rely on color-changing paper detectors to provide a baseline assessment of airborne chemicals, while fire departments might use handheld and stationary detectors to determine the same information.

Most fire departments, urban search and rescue and CBRNE military units carry a wide-range of handheld, sophisticated detectors to determine the specific properties of air samples that may be latent with toxins. In addition, many fire departments rely on grants provided by DHS to purchase high-end detectors. Each of these instruments can provide slightly different

information about the chemicals present. Only recently have the standardization and quality of these detectors – many of which are made and sold by private companies – been evaluated for consistent, accurate results. Under a program funded by the Department of Homeland Security, researchers at INL are analyzing the accuracy and consistency of the most common detectors by interviewing first responders in the field, compiling manufacturer's data, and performing gap analysis which will outline all the known gas chemicals that need to be detected, and compare them to the gas chemicals that each unit actually detects. The research will also identify what procedures need to be put into place to ensure the proper device is being utilized at the appropriate time.

In addition, the research will also examine how consistently manufacturer's claims concerning battery life, durability, device weight, and range match with real first responder field testing and experience. The results of this research will help DHS formulate guidelines and standards for future chemical detection technology, and allow first responders to more accurately communicate essential information to the public. The INL work will also allow a

INL researchers are analyzing the effectiveness of handheld chemical detectors like this one to determine how accurately and quickly they detect the presence of potential toxins



National Security



For more information:**Keith Daum**

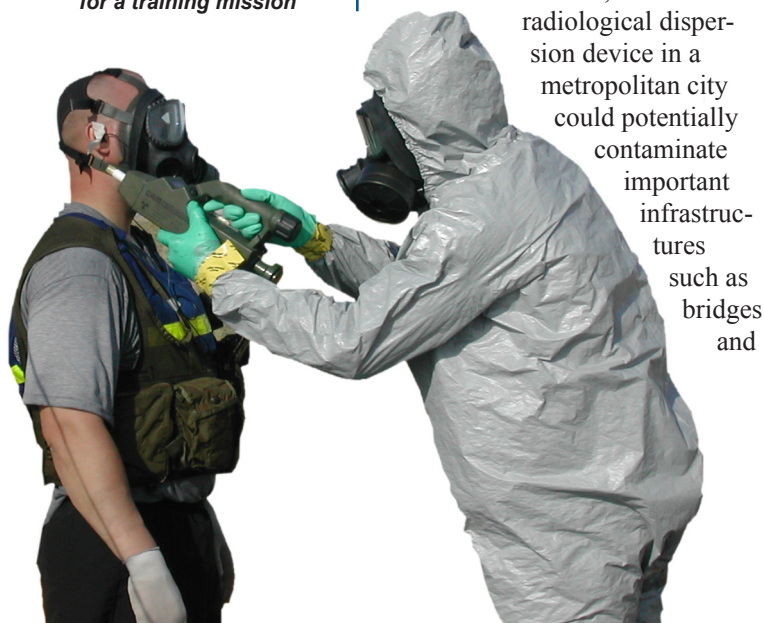
(208) 526-8172

Keith.Daum@inl.gov**Bob Fox**

(208) 526-7844

Robert.Fox@inl.gov**A U.S. Department of Energy
National Laboratory**

A National Guard civil support soldier handles an airborne chemical detector while preparing for a training mission



more efficient use of resources including time and money, and will establish a method for quickly analyzing important data and establishing a procedure for additional actions.

The Shark Program

By all accounts, most of the research and development work performed for DHS at national laboratories examines ways to deter, detect, and prevent a terrorist attack from occurring. And yet, a major mission area for DHS involves response and recovery efforts following an attack, natural disaster or other major emergency.

Today, many national security experts believe that the next terrorist attack in the United States will involve radiological or nuclear dispersion devices. Dirty-bomb scenarios are as prolific as Hollywood movies depicting them, but regardless of factors like motivation or timing, most nonproliferation experts agree that a small amount of radionuclide material dispersed within a highly-populated area using conventional explosives will most likely result in a lengthy and costly cleanup effort.

In addition, the use of a radiological dispersion device in a metropolitan city could potentially contaminate important infrastructures such as bridges and

tunnels, historic monuments, and national icons. The impact of a radionuclide attack on these structures could have a significant effect on economic stability and national moral.

Preserving and restoring national icons affected by radiological fallout without destroying or damaging them is a complex issue. However, ongoing research and development at INL funded jointly by DHS and the Defense Advanced Research Projects Agency (DARPA) is exploring methods for using low-energy lasers to enhance the performance of cleaning solutions and foams, and contains the permeation of contamination.

In 2004, INL established and continues to manage a chemical testing facility in which samples of common structural and monument material like granite, cement and marble undergo a nonintrusive laser scanning process.

The laser process is similar to the methods used to clean priceless artifacts and artwork that over time naturally collect acidic dirty and grim from exposure to the atmosphere. At INL, research into the restoration process occurs in steps which begin by coating the material with a laser transparent polymer. This step captures and removes much of the loose radioactive contamination. The next step involves scanning the materials with a 12 inch laser pattern for a duration of 10 seconds. The ultraviolet wavelengths which make up the laser's light work to redistribute radionuclide to the surface of the structural material where it can be effectively cleaned and returned to functionality.